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ABSTRACT

This publication describes features of the South Central Kansas Elementary Math-Science (SOCKEMS) project developed as a child-centered program, although the actual teaching materials and methods are not described. Materials are presented in such a way that children learn science by using their perceptual ability to great extent. Considerable emphasis is placed on concrete, tangible, observable investigative activities. Inservice teacher workshops to orient teachers with the methods and materials are provided. Evaluation of the program showed considerable student success related to short term and long term achievement and attitudinal changes. This work was prepared under an ESEA Title III contract. (PS)

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South Central Kansas Elementary Math-Science Project

SOCKEMS 71

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SOUTH CENTRAL KANSAS ELEMENTARY MATH-SCIENCE PROJECT

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
OFFICE OF EDUCATION
WASHINGTON, D.C. 20202

ELEMENTARY AND SECONDARY EDUCATION ACT OF 1965, Title III

I HEAR. AND I FORGET

I SEE. AND I REMEMBER

I DO. AND I UNDERSTAND

Introduction

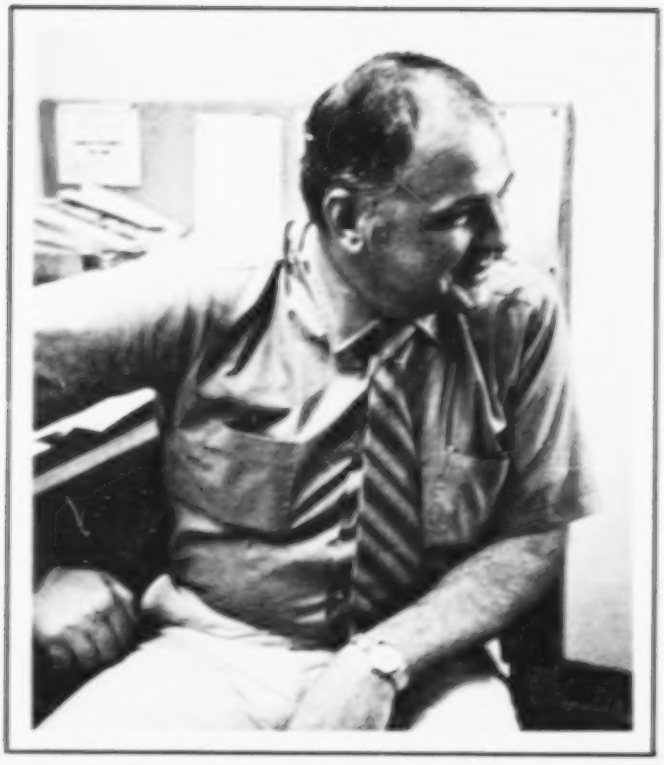
This is the story of a remarkable educational innovation known as SOCKEMS.

The South Central Kansas Elementary Math-Science Project represents a first-of-its-kind experiment combining new math and science into one elementary course. The approach was created with the help of a three-year grant from the U.S. Department of Health, Education and Welfare to the Kansas State Department of Education under Title III of the Elementary and Secondary Education Act of 1965.

An innovative plan, SOCKEMS, was initiated in 15 school districts in seven counties in the heart of the nation. And in those districts, it has put students "in action" at the center of the enterprise known as education.

The emphasis has been on the learning process, and the result is a new concept that teaches children, by doing, how to apply the valuable tools of science to everyday living.

SOCKEMS was developed under the direction of Dr. John M. Nickel, associate professor of science education at Wichita State University. Title III director for the Kansas Department of Education, which administered the grant, is Phillip Thomas.



DR. JOHN NICKEL

an Associate Professor of Science Education at Wichita State University, is director of the project. He is responsible for supervision of the entire project and personnel. Also, he is immediately involved with keeping the administrators of the cooperating school districts and the state agencies informed as to the progress of the project.

Science is Perception

Plato's centuries-old observation, "science is perception," is a simple one — so simple, in fact, that it seems to have confounded, more than enlightened, educators since Plato's time.

Assuring themselves that perception is an abstract process, educators have reduced the study of science and mathematics to tables and formulas and charts that made the abstract easier to handle but, unfortunately, no easier to understand.

Recently, however, a group of Kansas educators broke with academic tradition by suggesting that perception can, indeed, be tangible.

The educators, participants in the South Central Kansas Math-Science Project SOCKEMS, are risking the censure commonly directed toward innovators and reformers who break with established methods.

These teachers believe what Plato wrote. They say science is perception, and they believe that perception is the product of concrete, tangible investigation rather than memorization and occasional teacher demonstrations.

And they are not only proving Plato was right, they are also enhancing their students' love of learning.

Not only are the kids in Kansas' innovative classrooms achieving academically in the short-run, they are also picking up valuable attitudes that will make life-long learners of them.

Not only do they say they like math and science better, they say they like school better too.

They're learning, by doing, and they're loving it.

I hear, and I forget
I see, and I remember
I do, and I understand

A Process Approach

Adopting an ancient Chinese maxim as their motto, SOCKEMS participants confirmed their loyalty to the belief that application, not memorization, directs the way to perception.

"I do, and I understand," their motto concludes, and teachers agree it is touching, seeing, manipulating, experimenting, speculating that lead to understanding. It is learning how to learn so that the educational process does not end with a text slamming shut at the end of an hour.

In fact, in many classrooms, teachers would have believed they had

failed had their pupils spent much of the hour with textbook in hand.

Putting the student at the center of the educational enterprise, the Kansans made "I do" a reality for thousands of youngsters in the Wichita area.

Using inexpensive materials — drinking straws, string, golf teas and accoustical ceiling board, for example — the teachers are putting "do" things into the hand of kids.

The innovative project, which combines math and science under one umbrella, is in fact dedicated to erasing emphasis on facts and substituting emphasis on the learning process.

Under the leadership of Dr. John M. Nickel of Wichita State University, the project is the first known attempt in the nation to draw out (and put together) the parallel thinking and learning processes which apply in both math and science.

Traditional methods of teaching math and science rendered the subjects nearly useless in practical life. Instead of empty, dead-end facts and formulas, the new math-science concept stresses discovery. And students are allowed to discover how and why things work, how to ask questions,

how to gather data, how to analyze or measure, how to evaluate.

The emphasis is on the process, says Nickel, not the conclusion. The quest is for perception, not memorization.

As Nickel puts it:

"This method does more than give a kid a wastebasket full of facts that have a half-life of about six years."

I hear, and I forget
I see, and I remember
I do, and I understand

For Teachers, Too

Although the South Central Kansas Elementary Math-Science Project is keyed to the interest and active involvement of youngsters, it also is a teacher-training approach designed to help innovative people help children learn.

Because teachers are expected to leave behind sterile objectivity in math and science, and embrace a subjective inquiry approach, massive changes in teacher techniques are required.

If a child is to think for himself, not just store data, teachers must learn that suggestion is the real art in teaching — that encouraging inquiry in

which the child can discover meanings for himself, rather than supplying dogmatic answers, is the mark of the true educator.

Use of the inquiry approach in teaching math and science as a single subject on the elementary level is revolutionary and, consequently, frightening to many teachers.

So, the Kansas project established as one of its primary objectives the improvement of educational opportunities for pupils by bolstering the competence and confidence of teachers.

In five-week summer workshops, project participants were given substantive background in both math and science. They were also given, through participation in the activities they would ask students to do later, understanding of the pragmatic philosophy essential to successful teaching of modern math and science through a discovery approach.

By actually making and firing rockets, for example, the teachers tested their own skills in determining wind drift, the angle of take-off and elevation.

Deductive reasoning became tangible when project participants exchanged shoe boxes containing a sin-

gle, unidentified object. Working with sounds, weight, and shape, the teachers used the available data to tell them the contents.

The number of wheat threads on a stalk or the number of raisins in a loaf of bread became the statistics on histograms to demonstrate means, medians, modes and graphs.

Through all the projects, a dual purpose was served: not only did teachers learn to use the inquiry method themselves, they also learned positive methods with which they could draw out the curiosity and delight there is in discovery.

The result was that teacher enthusiasm was up so much that many teachers began using new and fresh approaches.

Interest was so high, in fact, that during one of the summer sessions teachers noticed a building undergoing renovation near the Wichita State campus, and when one of them spotted workers loading perforated accoustical tile onto a truck for disposal, he and his colleagues rushed to the site and stripped the truck of the tile.

The result was a free batch of "geo-boards," which, with the addition of golf tees and rubber bands,

become handy instruments for illustration of principles of plane geometry.

The teachers also became familiar with modern materials and consultation services available for year-round use.

If one believes that science is the effort to find out what to do with the universe and what to do in the universe, another objective of the math-science project is apparent.

In an ever-changing world, "facts" are revised continually, making much that the student learns in elementary school obsolete by the time he reaches high school.

Learning processes, however, are not subject to the same updating.

The new math-science concept trains teachers to help children learn how to find answers and how to apply science techniques to everyday life.

I hear, and I forget
I see, and I remember
I do, and I undestand

Learning–A Thing to Enjoy

When evaluators were asked to look at the Kansas math-science project, they found that students were

learning as much under the curricular innovations and enjoying it a lot more.

Testing thousands of kids in grades K to 8, the evaluators found that the youngsters' achievement levels were about the same as in the control groups.

Their attitude, however, was different. Project students said they not only liked math and science better, but they said they enjoyed school more as well. With higher scores indicating a more positive attitude, the obtained results were:

	Average Score	
	Experimental Group	Control Group
Math	20.01	17.86
Science	24.97	21.61
School	18.60	16.70

On a student opinion survey, 65% of the students in the experimental group said they liked both math and science better after their classrooms began using the SOCKEMS approach, while 53% of the control group said they liked those subjects better this year than last year.

And teacher attitude was high — 100% of the objectives on teacher attitude were met.

Thus the evaluators found that the youngsters in the innovative classrooms were learning as much as the students in traditional science and math courses, and their attitude was significantly improved.

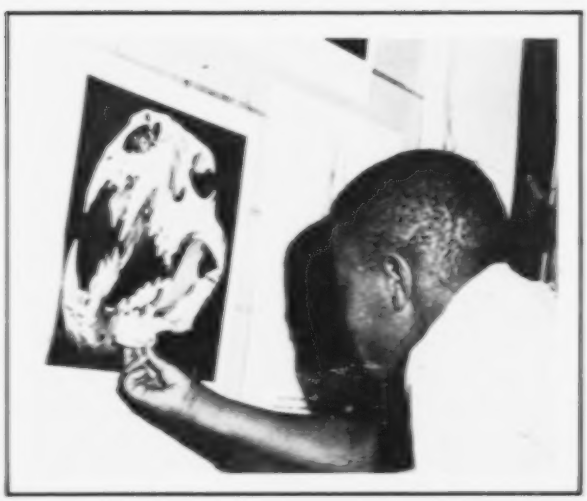
A summary of total results of the evaluation by Selection Research, Inc., of Lincoln, Nebraska, shows that 55% of the student achievement objectives were met, 89% of the attitudinal objectives were satisfied, and 70% of the opinion goals were reached.

The formal results merely confirmed what Nickel and his colleagues throughout south central Kansas had suspected for some time.

They had noticed, for example, that enrollment in summer school courses early in the project had consistently increased throughout the summer, even though attendance was strictly voluntary.

In fact, students were bringing both friends and parents to the classes by the end of the summer.

"They're capitalizing on what we've known for a long time," said one evaluator. "Kids enjoy learning if you structure the environment for them."



I hear, and I forget
I see, and I remember
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A Winning Combination

The enthusiasm of teachers and students involved in the South Central Kansas Elementary Math-Science Project is indicative of the success of the new inquiry approach to the two disciplines.

The enthusiasm that began with teachers, for example, has not only carried itself into the classroom to students, but it has also been transmitted into entire schools with a contagion prompting some districts to toss aside traditional textbooks in total support of the innovative program.

School districts represented in the project have demonstrated their whole-hearted approval by budgeting for special math-science materials. Some schools endorsed the new teaching concept by requesting in-service training for the entire elementary faculty. Others invited the school's project teacher to teach demonstration classes for other faculty members.

Learning of the success of the program, neighboring school districts have asked to be included in the project.

Ralph Waldo Emerson once ac-

cused education of producing "students of words."

"We are shut up in schools and colleges and recitation rooms for 10 or 15 years and come out at last with a bag of wind, a memory of words, and do not know a thing," he said.

The Kansas project is changing all that, however.

Teaching a child a process gives him a tool he can utilize for the rest of his life and, with modification, apply to any body of knowledge.

Because it is geared for children of elementary age, tools of education in the math-science project are concrete. Math and science books have become references, and texts are now blocks, geo-boards, rubber bands, and ice cubes.

"I do, and I understand," is one secret to the success of the forward-looking Kansas project.

The other might be termed, "I do, and I enjoy."

Thus, the Midwest educators who have designed and implemented the new math-science concept have hit upon a winning combination that may serve as a model for other educational innovations.

Students are learning by doing, and they are enjoying more of what they are doing than ever before.

SOCKEMS — a new name in success in elementary education.

Summary

SOCKEMS has proven that teachers willing to accept innovation can make meaningful changes in the learning habits of kids, as well as in the teaching habits of instructors themselves.

Some 80% of the teachers selected by superintendents for the original cross-training in the innovative approach succeeded in making the change. And those teachers have become valuable "change agents" in the school districts they represent and in other schools which have expressed an interest in the new concept.

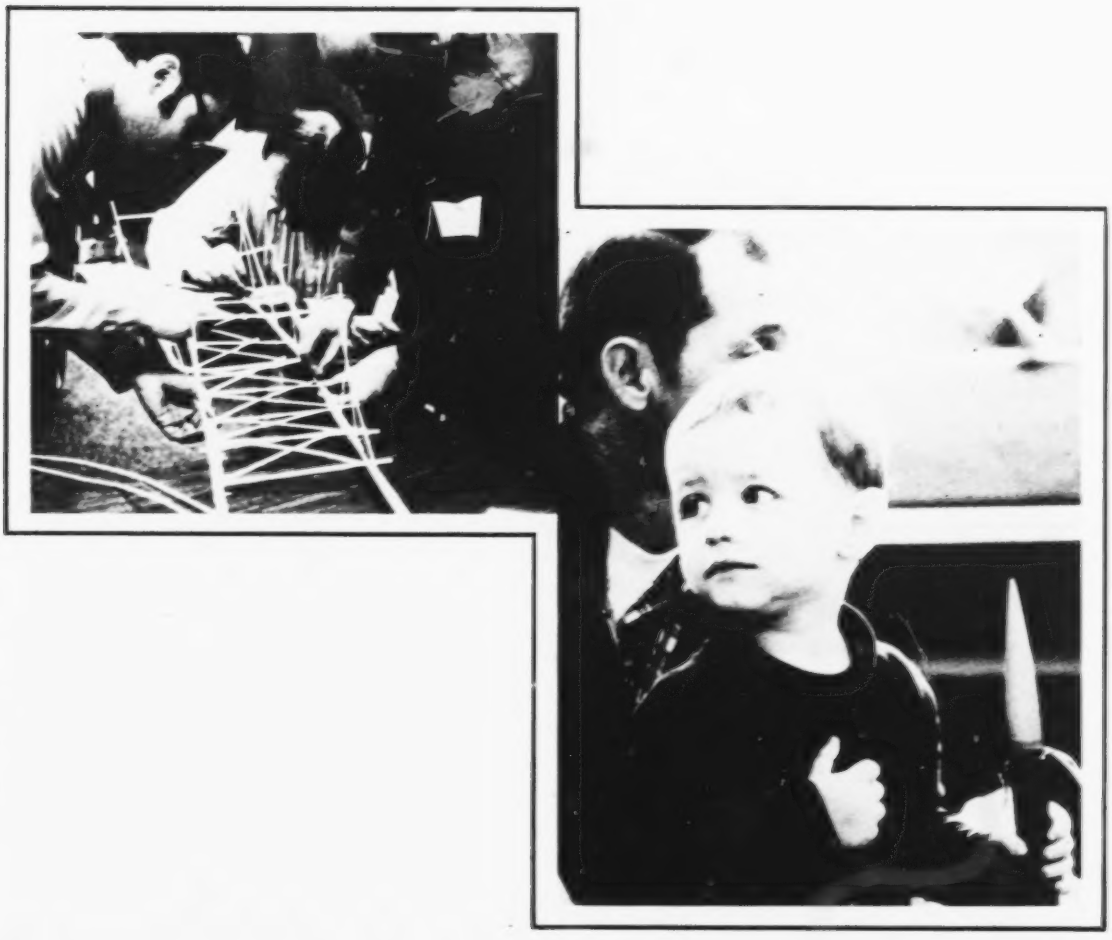
But it also took more than that. It took school boards willing to budget for new materials, teachers willing to attend in-service training sessions, parent associations which lent their support intangibly through discussions of the concept and tangibly through gifts of materials for implementation of the approach.

With that kind of support, and with the willingness of Wichita State to house the project after the federal grant ends, SOCKEMS is assured of an important place in educational reform.

Science Is Perception

Suggestion Is the Art of Teaching

FOOD FOR
THOUGHT



"The State's Title III Section believes that Dr. John Nickel and his co-workers have succeeded in creating an improved program in science and mathematics. The pupils' apparent progress has been objectively evaluated; therefore, positive features of the SOCKEMS project should be made available to the nation's educators." — Henry V. Elliott, Education Specialist, Title III, ESEA